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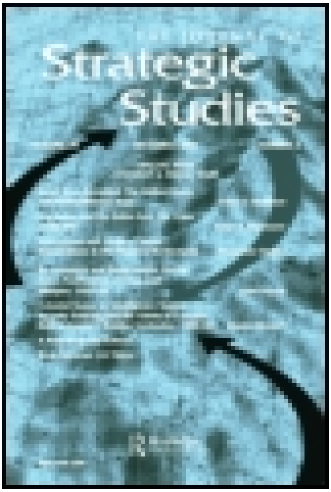

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Learning to Love the Bomb: The Command and Control of British Nuclear Forces, 1953–1964

STEPHEN TWIGGE and LEN SCOTT

The command and control of nuclear forces has emerged as an important concern in strategic studies. Yet the study of British command and control has been sparse. This article provides the first archive-based outline of the development of command and control of British nuclear forces in the period 1945–64. It examines the British response to the emerging Soviet ballistic missile threat: by appointing a designated deputy Prime Minister with the authority to launch Britain's nuclear forces; by establishing an alternate government headquarters outside London for authorising nuclear retaliation; and by delegating nuclear authority to the military. This article documents for the first time how nuclear release authority was delegated to Bomber Command, in the event of a Soviet nuclear attack and the destruction of Britain's political leadership.

Writing in *Survival* in 1989, François Heisbourg, then Director of the International Institute for Strategic Studies, lamented 'the dearth of open literature' on British nuclear command and control.[1] Without such information, he argued, a precise comparison of British defence policy with that of other nuclear weapons states was almost impossible. The lack of information on British command and control was all the more apparent when viewed against the growth of the subject area in the United States.[2] Indeed, in the years since Heisbourg made his remark (with a few exceptions) little has changed.[3] Moreover, with the collapse of the Soviet Union, some academic studies and previously classified government reports on the development of US command and control have emerged which provide a very different portrayal of American command and control, and details various failures of US Command, Control, Communications and Intelligence (C^3I).[4]

The issue of command and control has been termed the second great debate of nuclear strategy. The first debate, which began in the mid-1950s, concerned the vulnerability of strategic nuclear forces to a disarming first-strike. Represented by the work of Wohlstetter and Snyder concern focused on measures to increase the survivability of the US nuclear arsenal and reduce the incentive for a Soviet first-strike.[5] The second debate on

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command and control emerged in the 1970s and addressed an aspect inadequately covered in the previous debate: command and control vulnerability was as essential to securing a second-strike capability as were survivable forces. In short, as Blair later explained, 'if command and control fails almost nothing else matters'.[6] The third and ongoing debate, focuses on 'the political *process* by which decisions were made in addition to the *substance* or final outcome of nuclear operations'.[7] Various studies of British nuclear history have dealt with aspects of command and control.[8] This article will provide a historical analysis of Britain's nuclear Command, Control, and Communications (C^3) infrastructure during 1953–64, based on recently released government documents.[9] It focuses on the arrangements for Britain's airborne strategic deterrent during this period.[10]

The study of nuclear command and control centres primarily around two related and fundamental concepts – positive and negative control. Positive control concerns the authorisation of nuclear operations. A fundamental requirement is that such authorisation can only be given by authorised decision-makers. The procedure by which individuals are granted authorisation depends on a state's constitution and political culture. The cardinal principle of positive control is that correctly authorised instructions are carried out. In contrast, negative control ensures that bogus or unauthorised instructions are ignored. The essential concern of negative control is to prevent accidental or unauthorised use of nuclear weapons including possible theft by sub-state actors. A paramount threat to positive control is the inability of the National Command Authority (NCA) to communicate with its military forces. This can occur in two ways. First, an enemy attack on vital command centres can destroy a state's entire political and military leadership. The destruction of the NCA is known as 'decapitation attack' and renders nuclear forces incapable of receiving an authenticated executive order.[11] The second challenge to positive control is failure in communications. A result of either sabotage or malfunction, a communications blackout severs the link between nuclear forces and the NCA. In both cases the attack so disrupts command and control that retaliation becomes unfeasible. In short, failure of positive control undermines a state's ability to mount a retaliatory nuclear strike.[12]

To maintain a secure second-strike capability, an essential pre-requisite of deterrence, several options are available: to harden communications and command centres; to adopt a launch-on-warning strategy; or delegate nuclear use authority to the military.[13] All three alternatives have disadvantages. Hardened facilities are expensive and can be defeated by increasing the yield (or number) of weapon(s) selected for attack. To launch-on-warning runs the risk of inadvertent nuclear use and raises the nightmare of accidental nuclear war triggered by false warning or miscalculation.[14] Delegation of control to the military removes all civilian constraints and makes war termination more problematic. A balance has therefore to be found between command vulnerability on the one hand and the risk of nuclear inadvertence on the other. Moreover, there is an implicit trade-off between these two positions. Measures that address the threat of nuclear decapitation increase the probability of catastrophic nuclear failure.[15] The way a state approaches this dilemma is ultimately dependent on political judgement, in which historical, constitutional, economic and cultural aspects play a significant role.

In the US, authority to make war is vested in the President who is Commander-in-Chief of the armed forces. This authority is constrained by the powers of Congress as laid down by the constitution and clarified by subsequent constitutional amendments. The advent of nuclear weapons, and of delivery systems which meant decisions might have to be taken in minutes, has seen the development of procedures that have been subject to academic and public scrutiny.[16]

The constitutional position in the United Kingdom is much less clear, and indeed potentially ambiguous, reflecting the absence of a formal constitution and the peculiar nature of British constitutional practice. Quite how the British constitution would operate under the circumstances of nuclear war can only be a matter for speculation, and on which official records provide only fragmentary glimpses of official thinking, and likely practice. The accepted constitutional position is that while sovereignty in the United Kingdom rests in Parliament, in practice the Prime Minister, advised by the Cabinet, is entrusted with responsibility for directing the defence of the state. In 1958, this position was reflected in the operational directives issued to Bomber Command which stated that 'the decision to use nuclear weapons is a political one and is taken by the Cabinet, and is executed by the Chief of the Air Staff through the Commander-in-Chief Bomber Command on behalf on the United Kingdom Chiefs of Staff'.[17] To understand the implications arising from this directive, it is first necessary to examine the command and control procedures adopted for British nuclear weapons.

The Custody and Transfer of Nuclear Weapons

The development of Britain's first nuclear bomb began in early 1947. Known as Blue Danube, the weapon was based on the design of the American Mk III device detonated over Nagasaki. Using plutonium as its nuclear core, the weapon was expected to produce a variable yield of between 5 and 30 kilotons. Due to a scarcity of fissile material, however, the RAF agreed that the first 100 bombs should be limited to a yield of 10 kilotons.[18] Overall responsibility for production of nuclear weapons was given to the Ministry of Supply. The design of the nuclear core was undertaken at Fort Halstead under the direction of William Penney, with work on the ballistic casing given to the Royal Aircraft Establishment, Farnborough.[19] Planning for the introduction of nuclear weapons into the RAF began in 1948. To examine this, the Chiefs of Staff established the Herod Committee under the Chairmanship of the Vice-Chief of the Air Staff, Air Vice-Marshal Sir Ralph Cochrane.[20] Composed of senior officers responsible for the use and handling of nuclear weapons, the Herod Committee was responsible for 'introducing the atomic bomb into the service and examining all associated training, personnel, equipment, storage and works problems'.[21]

The Herod Committee was hampered in its work by the absence of any definitive policy on the transfer of nuclear weapons to the military. To address the issue, two proposals were considered. First, due to the special nature of the atomic weapon, delivery to the RAF would only occur in an emergency and responsibility for storage and inspection under secure conditions would be placed with the Ministry of Supply. Second, the atomic bomb was to be regarded as comparable to other modern weapons and that delivery from the site of production to RAF units should proceed in a similar manner to other high security items. In examining both proposals, the Air Ministry conceded that 'the maintenance and assembly of the bomb, its potency, complexity, limited numbers and relative cost, make it a special weapon perhaps requiring unorthodox measures'.[22] However, as production of the bomb was not expected until the early 1950s, a final decision on custodial arrangements was deferred.

Information obtained from the American nuclear programme also influenced Britain's custodial system. Although operational details of American nuclear weapons were supposedly forbidden to the British, it is apparent that the RAF had information which showed that US nuclear weapons were not armed finally until they became airborne.[23] In comparison, the first prototype British atomic weapon designed in 1950 required an assembly team of 14 men and took seven hours to assemble.[24] A further design feature entailed the insertion of the fissile material during the third hour of assembly. This meant, for a period of four hours there was a 'risk of fission, or of partial fission... in the event of accident or of enemy attack'.[25] In January 1951, in light of the information about the American system, the Herod Committee (with the support of the Air Ministry) recommended strongly an urgent study of the practicalities of re-designing the weapon to incorporate the following sequential modifications: the later insertion of the fissile material, preferably during the fifth to seventh hour of assembly; the insertion of the fissile material by use of a mechanical system integrated with the bomb (tube insertion); and in-flight insertion by a hand-operated or remotely controlled mechanism.

To adopt the tube insertion method, a major redesign of the bomb assembly was required. The essential feature of this technique was that the fissile material could be stored separately from the weapon casing and inserted via a tube or aperture into the fully assembled weapon at the last moment.[26] A particular advantage offered by the insertion method was that custodial arrangements for the bomb casing and fissile core could be treated separately. In June 1951, the Herod Committee recommended the adoption of such a system for British atomic weapons. In the US, a similar system of dual responsibilities was already in existence. A primary criterion of the American system was that although nuclear bomb components were stored under military supervision, the fissile cores were under the civilian control of the Atomic Energy Commission. Only after receiving Presidential authority could the two elements of the weapon be brought together.[27] In Britain, the possibility of storing the fissile cores under the civilian supervision of the Ministry of Supply was examined but rejected. The Ministry of Supply considered that once completed, custody of the weapon was a RAF concern and 'resisted any attempt to transfer part of the responsibility for storage back to them'.[28] It was nevertheless noted that:

> The US Atomic Energy Commission holds the cores for USAF weapons. If our system of holding appeared to the Americans to be less secure politically than their own, this might make it more difficult for us to procure American atom bombs for our own use. This is a hypothetical disadvantage, which could probably be circumvented.[29]

Despite the fact that the storage of nuclear weapons under military control was not a major concern within Britain, it was still thought advisable to separate the nuclear core from the weapon. This was to accommodate the RAF's requirement for in-flight insertion, which increased both safety and operational flexibility. It enabled fissile material to be returned to the UK in the event of an abortive mission when operational circumstances demanded jettisoning the bomb casing. It eliminated the risk of a fissile explosion during take off, and, the possibility of an accidental nuclear explosion over friendly territory was eliminated.[30]

In early 1951, custodial arrangements were agreed, whereby the RAF became solely responsible for the custody and storage of all atomic bombs after production, including responsibility for the fissile cores and all component parts.[31] The policy was adopted to provide the RAF with the necessary handling experience of atomic weapons and ensure that Bomber Command could adopt an optimum state of readiness at all times. To achieve this capability all atomic bombs held by the RAF were to be 'available for immediate operational use if required'.[32] This requirement proved difficult to accomplish, for reasons explained by the Vice-Chief of the Air Staff:

> One of the components, the 'initiator', is subject to decay, and has a service life of only 50 days after manufacture. For the time being we propose, therefore, to maintain only the first lift of bombs at a continuous state of readiness. In an emergency, initiators for a second lift can be provided at two days notice, and for a third lift after a further five days. Alternatively, if seven days' prior notice can be given, the three lifts can be made available simultaneously.[33]

The custodial system adopted by the RAF for the storage of atomic weapons was based on two principles. In the absence of a fissile core, the weapon casing was to be regarded as comparable to other modern weapons, such as guided weapons, and subject to existing security arrangements covering details of construction. Custody of the fissile cores would be the responsibility of a separate security system established outside the framework of existing supply channels. In both cases, however, 'it was decided that the atomic bomb should be regarded as a normal weapon, and that no special posts should be created within the Air Ministry to deal with it'.[34]

An important aspect of the custodial system was the final location of the nuclear weapon storage sites and the selection of custodial officers. Various possibilities were apparent: to co-locate both the casings and fissile cores at selected airfields or advanced ammunition sites; to store the casings at airfields whilst retaining centralised control of the cores; or to retain centralised control over both elements of the weapon at a single site. In relation to the selection of custodial officers, the options included: devolving responsibility onto normal station guards; establishing a special RAF Regiment unit; or the use of specially selected and screened Air Ministry wardens.[35] In 1953, storage arrangements were agreed: nuclear weapons (including cores) were to be stored in two separate compounds at each medium bomber airfield under the supervision of specially trained RAF personnel.[36]

In addition to these measures, a series of procedural mechanisms were implemented to safeguard against unauthorised use. The two sections of the weapon were stored in different areas, with the fissile core contained within a specially designed and locked container. The incorporation of safety devices also ensured that a nuclear explosion could only occur after a specific sequence of positive arming measures had been completed. The assembly team for the first Blue Danube weapons consisted of two officers, a warrant officer, three senior NCOs and eight corporals, under command of a flight lieutenant. To ensure the safety of the assembly team, the nuclear weapon storage areas were equipped with radiation monitors and provided with a ventilation system to reduce the risk of inhaling toxic particles. Respirators were also used during the handling of these components and personal monitoring badges (which measured each individual's exposure to radiation) were worn at all times within the storage and assembly buildings.[37]

The imminent delivery of fully-fabricated weapons to the RAF required a formal decision by the government on the deployment policy in the United Kingdom for the use of nuclear weapons. In early 1953, the Defence Committee decided:

> Responsibility for the storage, periodic testing, maintenance and the assembly of atomic weapons should be given to the Air Ministry but that nevertheless the Air Ministry would have no authority to move atomic weapons out of the United Kingdom without the express permission of the Government.[38]

Britain's first operational atomic bombs were delivered to RAF Wittering in November 1953 (despite the fact that that the RAF had no aircraft capable of carrying them) and by the end of the year five weapons were under the effective control of Bomber Command.[39]

Vulnerability and Civilian Control

In the immediate postwar years, the political command structure governing Bomber Command operations remained unchanged. The development of atomic weapons coupled with the perception of the Soviet nuclear threat, however, required a more responsive chain of command. The time-urgent nature of mounting a successful counter offensive required dissemination of the executive order prior to the destruction of Bomber Command's airfields. The dispersal of the force in times of crisis was one method of avoiding destruction on the ground. The success of the dispersal scheme, however, was dependent on two related factors: command authorisation to disperse and possibly launch the force, and the provision of reliable communications.

A firm proponent of adapting the higher command authority to accommodate the strategic imperatives of the nuclear environment was Air Marshal Sir Kenneth Cross, a future C-in-C of Bomber Command. In examining the effects of a Soviet nuclear attack on the United Kingdom, Cross observed in 1953 that:

> Under the time scale given in Global Strategy, there will be no time for the ponderous machinery of the last war to take effect. You will remember that Bomber Command's operations were controlled then by means of directives to the C-in-C from the Air Ministry acting on behalf of the COS [Chiefs of Staff] – the COS having previously reconciled the demands of the numerous other Ministries in Whitehall. This method was considered very unsatisfactory by the C-in-C, even in the slow time process of the last war.[40]

In December 1954, the Chiefs of Staff directed Bomber Command to plan on the assumption of receiving no advanced warning of enemy attack.[41] This decision had important implications for both Bomber Command's dispersal plan and chain of command. In short, Bomber Command could only rely on receiving tactical warning of enemy attack. It was estimated that the early warning system, in combination with intelligence sources, would provide a warning period of one hour of impending air attack.[42] The consequences were conveyed to C-in-C Bomber Command in the following terms:

> Your force must therefore be trained so that all serviceable aircraft could be airborne within one hour of receiving an executive order. This order would contain directions either to strike against pre-selected targets or to proceed to holding areas. These targets will in due course be given to you by the Air Ministry, after approval by the Chiefs of Staff. In the meantime you should assume for planning purposes that first priority will be given to the Soviet Long Range Air Force bases.[43]

The procedure for issuing directives to Bomber Command was also re-examined. As presently constituted, the war directive could only be prepared and issued by the government after the declaration of war, a procedure considered too cumbersome to facilitate a rapid response.[44] Consequently, an alternative method of issuing the directive was proposed. The new procedure envisaged formulation of the war directive during peacetime, including its formal approval by the Defence Committee. The Chief of the Air Staff was also granted authorisation to issue the directive governing the employment of the bomber force upon immediate outbreak of hostilities. It was, however, considered essential that the order was confirmed at Cabinet level 'before Bomber Command aircraft were committed to hostile actions'.[45] To further reduce the vulnerability of the V-force, authority was sought for the C-in-C Bomber Command 'to order his available aircraft off the ground in case of surprise attack on the UK without consulting anyone'.[46]

In light of these developments, it was recognised that the 1953 political directive governing the employment of nuclear weapons would soon become inadequate for the strategic environment of the late 1950s. The problem was compounded as the procedures for obtaining political approval to initiate nuclear war also remained uncertain. With the introduction of the medium bomber dispersal plan and the deployment of Blue Danube weapons, the lack of clarity began to affect military planning.

In recognising that existing procedures were no longer applicable to the demands of nuclear war, the Cabinet initiated a review of the government's emergency powers, undertaken by the Defence (Transition) Committee chaired by the Cabinet Secretary, Sir Norman Brook. The Committee was directed to consider the most appropriate form of emergency powers which the executive would require in a future global war. Significantly, not only was the committee expected to examine those emergency powers which would be required after the outbreak of war, 'but also the powers required during the period when war appeared imminent in order to carry out certain precautionary measures'.[47]

For planning purposes, a warning period of seven days was assumed, a timescale that represented the period from an increase in international tension to a nuclear attack on the United Kingdom. It was considered that during this period, the government would be required to implement certain precautionary measures including the evacuation of 12 million people from urban centres, the establishment of emergency hospitals, the requisition of vehicles and transport systems, the dispersal of key workers and the arrest and detention of suspected saboteurs. Many of these measures were controversial and would take time to implement. However, it was regarded as essential that the government of the day possessed the necessary emergency powers immediately there was reason to expect an attack on the UK. To implement the emergency powers, three courses of action were available: introduce a peacetime bill enabling defence regulations to be brought into operation by an Order-in-Council when war was considered imminent; rely on enactment of an Emergency Powers Defence Bill when the necessity arose; or rely on the exercise of the Royal Prerogative.

All three proposals presented significant difficulties. The introduction of a bill in peacetime had the advantage that there would be no time constraint for the enactment of relevant legislation. Against this was the argument that Parliament would be reluctant to enact in peacetime legislation which conferred on the executive such far-ranging powers. The introduction of a bill during a period of crisis also had advantages. Parliament would be less inclined to oppose the additional powers requested by the government of the day. However, during a period of mounting international tension the government would primarily be engaged in attempts to prevent the outbreak of war. Consequently, there would be a delay in asking for emergency powers for fear of precipitating an escalation of the conflict. As the first few hours of a nuclear war would be decisive, it was considered that any delay in taking precautionary measures before the initial attack would be catastrophic.

The final option was to exercise the Royal Prerogative. To employ the Prerogative, the executive was required to advise the sovereign to approve Orders-in-Council authorising the use of emergency powers including the possible use of nuclear weapons. However, to invoke the Royal Prerogative before the actual outbreak of war was considered unconstitutional and would have required either an Act of Indemnity or retrospective approval from Parliament. In these circumstances, it was considered that the use of the Royal Prerogative should only be considered by the government as a matter of last resort.[48]

Launch on Warning

The review highlighted the constitutional problems faced by the British government in establishing agreed procedures for launching the deterrent. Yet, with a possible decision required in only 15 minutes, it was essential to possess such authority in advance to order nuclear forces into action with the minimum of delay. In early 1958, the higher command authority for launching the deterrent was formally agreed and based on the assumption that the final decision to commit Britain's nuclear forces would not be taken 'until there is confirmation that an attack has been launched by the Soviet Union'. The agreed measures and procedures were described as follows:

(i) On receipt by the Joint Intelligence Committee of Intelligence information which indicates that the Soviet Union is likely to launch an attack, certain designated United Kingdom Ministers, the Chiefs of Staff and the United States Intelligence authorities will be informed.

(ii) The Chief of the Air Staff will immediately order all possible unobtrusive measures to bring the Royal Air Force to a state of operational readiness. Further measures which would inevitably involve publicity would be considered by the Cabinet under (iv) below. The Air Ministry will inform the Commander of SAC [US Strategic Air Command] units in this country of the action that is being taken to improve the state of readiness of the medium bomber force.

(iii) A meeting of the Cabinet will be summoned at which the Chiefs of Staff will also be present.

(iv) The Cabinet will decide, in the light of the Intelligence information, what further preparatory measures should be taken.

(v) Arrangements will be made for the Prime Minister to speak personally to the President of the United States.[49]

Once launched, the V-force would either proceed directly to assigned targets if the executive order had already been issued, or remain airborne and await further instructions. This latter option increased the flexibility of the force as it allowed bombers to be launched prior to receipt of a strike execution order. To sanction this procedure, the Chief of the Air Staff was authorised 'at his discretion' to launch the bomber force if he considered such action necessary to avoid destruction on the ground.[50] The procedure known as 'positive control' or 'fail safe', required the aircrew to make radio contact with selected stations along the route in an attempt to receive the 'go code'.[51] A central feature of the procedure was that if the fail safe point was reached and no order had been received, the bomber was to return to base or its designated relocation site – in no circumstances was the target to be attacked in the absence of an authenticated 'go code'. Heavily dependent on reliable communications, the concept nevertheless reinforced the primacy of political control over nuclear forces.[52]

The Role of the Prime Minister

By the early 1960s, the procedures for obtaining political authority to initiate retaliation nevertheless remained ambiguous. The problem had been exacerbated by the deployment of Soviet Medium/Intermediate Range Ballistic Missiles (M/IRBMs), which reduced reaction time to 15 minutes. To address the issue, the Chiefs requested that the procedures contained in the government war book for 'alerting and releasing our nuclear retaliatory forces... should be reviewed'.[53] The purpose of this review was twofold: to examine the procedures involved in the decision to authorise nuclear retaliation; and to determine the necessary communications required by the Prime Minister and others to achieve this objective.[54] The body given responsibility for conducting the review was an *ad hoc* Cabinet committee known as GEN 743. All files relating to the committee's discussions are retained.[55] However, using related source material the committee's broad conclusions can be ascertained.

A primary consideration was given to the role of the Prime Minister in authorising nuclear operations. Occupying the role of *primus inter pares* within the Cabinet, the Prime Minister's powers though considerable were largely undefined. The issue of the Prime Minister's authority now required clarification. A motivating factor that explains this requirement was the terms of the 1958 Murphy-Dean agreement.[56] The agreement, which covered the launching of US nuclear weapons based in the United Kingdom, stipulated that the decision to commit nuclear forces would be a joint decision reached between the Prime Minister and the President of the United States.[57] Thus, while it was still possible to consult the Cabinet, the decision rested ultimately with the Prime Minister. To sanction this role, the Prime Minister assumed the Royal Prerogative, which granted the exercise of executive power without recourse to Parliament or the Cabinet. The constitutional position of the Prime Minister to authorise nuclear retaliation was later described in the following terms:

> The final decision about the use of nuclear weapons rests solely with the British Prime Minister. If the question of use arose, the extent of the Prime Minister's consultations with the Cabinet and the Sovereign would depend on the circumstances, particularly the time available.[58]

The privileged position of the Prime Minister to authorise a nuclear attack raises at least three salient questions. First, what were the procedures for ensuring the safety of the Prime Minister and for maintaining communications in the event of attack? Second, who would have assumed authority in the event of the Prime Minister's death or incapacitation? Third, what safeguards existed to prevent the Prime Minister authorising nuclear attack if the decision was strongly opposed by the Cabinet and/or the military authorities? While at present these questions cannot fully be resolved, the veil of secrecy which often surrounded these issues has been partially removed.

In times of national crisis, the normal process of Cabinet government was expected to be dissolved, with executive power transferring to an *ad hoc* group of ministers functioning as a 'War Cabinet'. The formation of a War Cabinet was expected to occur when 'serious military operations became imminent' – at this point the government would 'be moving into the strategic warning stage, which would bring War Book planning into operation including the possibility of a small War Cabinet'.[59] To serve the War Cabinet, a Transition to War Committee was to be established. Comprising the Cabinet Secretary, the Permanent Secretaries of all departments and the Assistant Chief of the Defence Staff, its primary function was 'to advise ministers, as required, on the implementation of the government War Book, and to co-ordinate departmental action in a national emergency'.[60]

The concentration of political authority within the office of the Prime Minister focused attention on the procedural arrangements for maintaining political control in the event of the Prime Minister's death. Occupying the apex of a hierarchical command system, the death of the Prime Minister without a clearly defined procedure for the transfer of executive power could render Britain's deterrent useless. In the US, the succession of command was clearly delineated with power transferring to the Vice President, the Speaker of the House of Representatives, the President *pro tempore* of the Senate, and to members of the Cabinet in order of seniority.[61] In Britain, no such succession existed. On the death of an incumbent Prime Minister the successor was chosen by the Sovereign in close consultation with Palace officials. Clearly, with the prospect of nuclear annihilation only minutes away, such a protracted system was no longer applicable. To retain the primacy of political control, the prior appointment of a designated successor to the Prime Minister with authority to order nuclear retaliation was considered essential. The position was described to Sir Norman Brook as follows:

> The principal aim is to consider alternative procedures for the release of nuclear forces if the basic procedure fails. One of the proposals is to nominate a Deputy to the PM for nuclear retaliatory purposes who would act in the PM's absence. He would not, perhaps, need to be nominated except in time of tension but his functions would have to be laid down in advance.[62]

This proposal was later accepted by Harold Macmillan who added a significant amendment of his own. Not one but two deputies to the Prime Minister were to be appointed: one of them authorised 'to act as the Prime Minister's deputy for purposes of nuclear retaliation during any period, however short, when the Prime Minister was not immediately available'.[63] What remains uncertain is whether the Prime Minister's designated deputy was chosen from the Cabinet's order of precedence or an individual personally selected by the Prime Minister.[64] The issue is unclear as the position of deputy Prime Minister did not exist in the British constitutional hierarchy. Indeed, in 1951 George VI specifically refused to accept Anthony Eden as deputy Prime Minister.[65] The matter was raised again in 1962, when Rab Butler was appointed as Macmillan's deputy. Informing Parliament of his decision, Macmillan stated that 'this is not an appointment submitted to the Sovereign but is a statement of the organisation of government'.[66] The constitutional position of the designated deputy is of more than academic significance. For, as discussed below, the delegated powers given to C-in-C Bomber Command were only to come into operation if communication could not be established with either the Prime Minister or designated deputy. Consequently, the identity of the designated deputy needed to be made apparent to those requiring such information well in advance of the Prime Minister's death or incapacitation.

A question not directly addressed by GEN 743, but which is nevertheless of concern, especially in the nuclear age, is what safeguards exist to prevent the Prime Minister authorising nuclear attack if the decision was strongly opposed by both the Cabinet and military authorities? In short, if a Prime Minister went 'bananas' what could prevent him/her unleashing a nuclear holocaust? The answer, it appears, lies in the peculiarities of the British constitutional system. Only the Prime Minister can authorise the use of nuclear weapons; only the military can legally issue the order to do so.

To further safeguard against one individual acting in isolation, a 'two-person' rule was introduced throughout the nuclear command chain from the Prime Minister down to the individual bomber crew. The procedure ensured that '*all* the individuals who have access to, or an executive function in, the system are selected using the greatest possible care, and...since no known methods of selection are infallible, some form of insurance is required, such as multiple control at each executive level'.[67] As a result, the Prime Minister could not initiate the use of nuclear weapons alone but required the assistance of another individual, widely believed to be the Chief of the Defence Staff, Britain's most senior military figure. Incomplete codes for authorising a nuclear strike are held by both individuals and only when the two sections are brought together can a fully authenticated launch order be transmitted to Britain's nuclear forces.[68]

Alternate Government Headquarters

To ensure a prompt retaliatory response, knowledge of the exact location of the Prime Minister at any given time was vital. Loss of contact through communications failure or enemy action would seriously delay the transmission of an authenticated launch order. In routine conditions, the Prime Minister's official residence at 10 Downing Street served as the focus of executive government within London. In direct communication with all government departments and linked to several underground operations rooms, the order to launch the deterrent could be issued by the Prime Minister directly from the Cabinet Office in Whitehall (or since December 1992 the PINDAR joint operations centre situated beneath the Ministry of Defence).[69] In times of crisis, however, London was regarded as a major target for a Soviet nuclear strike. In the early 1960s, to provide a secure facility for the continuation of government in the event of a nuclear strike, the Prime Minister agreed to the construction of an alternative seat of government located outside London. Known as 'Turnstile', the complex was constructed 100 feet beneath the ground and reportedly extended over 54 acres of countryside close to the Wiltshire town of Hawthorn, near Bath.[70]

The concept of an alternative seat of government located away from the nation's capital first began to receive close attention in mid-1950s. In the US, fear of a surprise Soviet missile attack on Washington led to development of an Alternate National Military Command Center (ANMCC) located underground near Fort Ritchie, Maryland. The facility was designed to operate in isolation for 30 days and intended to provide 'sufficient information for ordering the execution, redirection, or termination of strategic nuclear operations'.[71] In Britain, the idea of using an underground command facility was investigated by both the UK Commanders-in-Chief Committee and the Padmore Committee.[72] In examining the arrangements for central government in the event of thermonuclear attack, government policy was described as follows:

> Ministers have accepted the view that it would be extremely unlikely that central control would continue to operate from London after attack and that the government of the United Kingdom would be conducted by a central nucleus in protected accommodation in the country. It is planned to establish two seats of government, a main and reserve, to carry out only functions essential to the prosecution of the war and the survival of the United Kingdom. One centre is to be manned in advance of war as a reserve seat of government and the other is to be available for the use of those exercising supreme direction should they at any time decide to leave London.[73]

The decision to leave London in the event of an imminent attack was governed by the Prime Minister's directive on 'Turnstile' planning and based on 'the principle that control should remain in Whitehall for as long as possible'.[74] If attack appeared imminent, a precautionary stage was to be declared with the Ministry of Defence given primary responsibility for co-ordinating military action to meet the RAF requirement to launch nuclear retaliation. The directive also explained that the functions of 'Turnstile' were to act as the seat of government in the period of survival and reconstruction, and to be an alternative centre to London for authorising nuclear retaliation.

The integration of 'Turnstile' into operational military planning proved difficult. A fundamental principle governing all Alternate Command Centre (ACC) planning was the overriding need to maintain absolute security. For if the location and purpose of the ACC was compromised, it would almost certainly become a primary target in a Soviet first strike. A particular concern was communications. In short, if communications were used for operational purposes, it was considered that within 48 hours both the location and purpose of the ACC would be known to the Soviets. It was therefore considered essential that no plans should be made for the exercise of operational control from the ACC during the pre-attack period.

Implementation of this procedure, however, was in direct conflict with the need to establish reliable communications. In reviewing the provisional arrangements in 1963, the Chiefs of Staff were informed that existing plans required the signals centre to be established at the same time as the military staffs were relocated to the ACC. For reasons of security, the line communications being installed by the GPO were unlikely to be operational within 48 hours. The Chiefs were further informed that the only long-range radio equipment presently available at the ACC consisted of surplus hand-operated sets limited to a Morse capability.[75]

Given this situation, the Chiefs concluded that under existing arrangements, communications at the ACC were unlikely to be sufficient or fully operational in time. Consequently, it was recommended that if the ACC was to fulfil its designated role, 'it must be capable of being functional within 72 hours from the declaration of a precautionary alert'.[76] To develop an efficient system, a regular nucleus of personnel was to be deployed within the ACC throughout peacetime on a 24-hour basis. The Chiefs also recommended that during a crisis, control should remain in Whitehall for as long as possible. Consequently, throughout the precautionary stage, command would continue to be exercised through the Ministry of Defence and associated operations centres: only when the powers of central government were transferred from London would control of the nuclear deterrent be switched from Whitehall to the Central War Cabinet Room in the ACC.

It is unknown whether the Prime Minister actively participated in 'Turnstile' planning. It is however evident that as part of 'FALLEX 62' (a NATO Command Post Exercise conducted in September 1962), a simulation of the 'Turnstile' procedures was undertaken. The scope of the exercise was described by the Minister of Defence:

> The Prime Minister has agreed that exercise planning for the Services should include the transition from Whitehall to an alternate seat of Government to be simulated in the exercise at Wilton Park near Beaconsfield; a Committee of senior officials should also take part in the pre-exercise play to represent both the Cabinet and the Defence Transition Committee and take in the exercise the sort of decisions which would face the Cabinet in reality at a time when war was imminent.[77]

Despite the construction of 'Turnstile' and the appointment of a designated deputy, the Prime Minister remained vulnerable. It is also probable that senior political leaders would be co-located with the Prime Minister. A Soviet nuclear decapitation attack targeted at both Whitehall and 'Turnstile' would therefore have removed the entire political leadership responsible for authorising nuclear retaliation. To guard against this possibility and ensure a nuclear response, it is now clear that political authority to initiate nuclear retaliation was delegated to military commanders.

Delegated Control

The delegation of nuclear command authority to the military is one of the most contentious and politically sensitive areas of nuclear operations. The ability of the military to initiate nuclear war without explicit authority from the political leadership fits uneasily within the traditions of a liberal democratic state. Moreover, in a society in which a significant part of the population was opposed to nuclear weapons, the knowledge that military leaders possessed such power would place the government under acute political pressure. As a consequence, the issue of nuclear pre-delegation has remained shrouded in government secrecy. Recently, however, with the end of the Cold War, a small but significant number of documents have been made available which for the first time shed light on procedures for the delegation of nuclear control to the British military.

British procedures for restraining unauthorised military use of nuclear weapons relied exclusively on procedural mechanisms. Nuclear weapons were deployed operationally near to (or aboard) their delivery systems with the only safeguard against unauthorised use being the allegiance of the military officers entrusted with their possession. While it could be argued that the military demands dictated by a 15-minute response time militated against negative control, it must be recognised that in adopting this procedure, the government implicitly granted *de facto* control of nuclear weapons to the military. The introduction of the two-person rule did not fundamentally alter this relationship. The codes authorising nuclear retaliation were not required to launch the force but only indicated that the originator of the order was indeed the Prime Minister.[78] In short, while the two-person rule maintained control at the lower levels of the command structure, in the absence of any electronic locks, senior military officers possessed the ability to order a nuclear strike even without receiving direct instructions from the Prime Minister.

The ambiguity of the command arrangements were certainly not lost on senior members of the RAF who in the early 1960s began to press for a more explicit and politically-sanctioned procedure that addressed directly the extent of the delegated powers available to senior commanders. A particular concern was the difficulty presented by a total breakdown of communications. In March 1960, in a candid recognition of the implications, the Director of Plans at the Air Ministry put forward the following recommendation: 'I think we must be prepared to seek political approval for the C-in-C Bomber Command, to launch the retaliatory force under certain circumstances. I have in mind cases either, where time does not permit prior consultation, or where communications breakdown entirely.'[79]

In the early 1960s, the extent of the C-in-C's delegated powers were determined by the alert conditions specified in the Bomber Command alert and readiness plan. Under the plan, the C-in-C Bomber Command was permitted on his own discretion to order Alert Condition 3. On declaration of this alert state, the maximum number of aircraft were to be loaded with nuclear weapons and made ready for immediate takeoff. The authority to order Alert Condition 2 and disperse the force, however, was not to be undertaken without first receiving political authority. The Chief of the Air Staff was granted the delegated authority so that 'at his discretion, he may order the force into the air under positive control procedure, if he deems such action necessary to avoid loss on the ground by enemy action'.[80] At no point in these procedures was political authority to initiate nuclear retaliation explicitly delegated to military commanders. However, in private discussions between the Air Staff and the C-in-C Bomber Command, it was appreciated that 'circumstances could exist... under which you would have to assume responsibility for launching the attack'.[81]

While the political implications of delegating formally authority to the C-in-C Bomber Command were contentious, so too were the consequences of denying such a request: a Soviet decapitation attack could so disrupt the command and control system that the nation's nuclear forces would be left paralysed awaiting instructions that would never arrive. In these circumstances, delegation of nuclear use authority to military commanders had much to commend it: acceptance would largely address the perceived deficiencies in command vulnerability and ensure nuclear retaliation under all conditions. If the Soviets believed that command authority had been delegated to the military it would both lessen the incentive to mount such an attack and increase the credibility of deterrence. Against such a proposal was the concern that diffusion of authority within the command structure would free the military from any political control and make negotiations leading to a ceasefire impossible.

These issues were discussed by Sir Norman Brook and a small group of senior officials in May 1961. The question was stark but simple – what alternative procedures were required by Bomber Command to dispatch nuclear forces in the event of communications with Whitehall having been destroyed by nuclear attack? In abstract terms, the answer was straightforward: the Commander-in-Chief was to seek instructions from the most competent surviving authority.[82] Specifying these individuals, however, was more problematic. The expectation was that in such circumstances, the C-in-C would 'seek instructions from the Prime Minister or his First or Second Deputy in that order; failing that, from any Minister (such as the Secretary of State for Air) with whom he may already be in touch and whom he can consult without loss of time.'[83]

It was also appreciated that whatever procedures were adopted, they could only be undertaken 'if telephone lines exist'. A particular concern was evidence supplied by the JIC that the Soviets were training saboteurs to knock out vital communication links in the government's nuclear control system and 'that the Russians would do their best to strike at these, by treachery or sabotage, should they find means to do so without prejudice to surprise'.[84] Given this assessment, it was conceivable that C-in-C Bomber Command would be unable to contact anyone in the event of a Soviet surprise attack. To guard against this, it was recommended that the War Book be amended and that the Prime Minister should authorise the C-in-C, in the last resort, to order on his own responsibility nuclear retaliation by all means at his disposal.

While issuing such a directive solved the problem at hand, it introduced others. A particular concern was nuclear inadvertence or, as it was termed within MOD, 'the destruction of Russia by mistake situation'.[85] One possible scenario was that:

> Egypt acquires a nuclear bomb somehow, drops it on London and C-in-C Bomber Command then ensures that Russia, the UK and the USA are all destroyed by bombing Russia...[we must be]...very careful to tie down C-in-C Bomber Command and give him very precise instructions e.g. about getting in touch with the Americans and doing his best, by contact with any surviving authorities in NATO, to discover whether Russia launched the nuclear bomb that destroyed Whitehall, before he has a go at Russia.[86]

This dilemma was never fully resolved. However, to ensure that C-in-C Bomber Command did not order British nuclear forces into action until absolutely necessary, the Prime Minister approved the following recommendation. In the event of a 'bolt from the blue' or a situation in which the Prime Minister was not immediately available, the C-in-C was authorised to order his bombers airborne under positive control; to seek contact with the Prime Minister, his deputy or American authorities; and in the last resort, when he had confirmed that nuclear weapons had landed in the country, to order nuclear retaliation on his own responsibility.[87]

These procedures were approved by Macmillan in August 1961, and later incorporated into a Supplementary Directive issued to Air Marshal Sir Kenneth Cross, C-in-C Bomber Command, on 25 September 1962. The directive granted 'certain delegated powers' in the event of a surprise nuclear attack and specified the circumstances under which they were to be exercised. The extent of these powers were described as follows:

> When either (a) from all possible sources of information available to you, you judge that your force in this country is about to be attacked with nuclear weapons and there has been no preceding period of strategic warning that a nuclear attack is imminent, or (b) nuclear bombs from an enemy attack have burst on this country before you have been authorised to retaliate, you are authorised:
>
> (i) To order all bomber aircraft within your Command to be airborne under positive control in accordance with the agreed plans covering this procedure.
>
> (ii) To seek contact by any means of communication open to you with the Prime Minister or his Deputy in London or at the alternate Government War Headquarters (Burlington), and to act in accordance with his instructions.
>
> (iii) To ascertain, if possible, what instructions the [US] Commander, 7th Air Division, has received and if [the] action above proves abortive and enemy nuclear bombs have burst in this country, to co-ordinate with the Commander 7th Air Division instructions to release nuclear weapons under joint control.
>
> If enemy nuclear bombs have burst in this country and [the] action above has proved abortive, you are authorised in the last resort to order on your own responsibility nuclear retaliation by all means at your disposal.[88]

Despite delegation of nuclear use authority to C-in-C Bomber Command retaliation was not wholly assured. In the event of a Soviet nuclear attack, High Wycombe (Bomber Command HQ) was expected to be a major target. The C-in-C may therefore have met the same fate as the Prime Minister or designated deputy. Although contingency plans existed enabling HQ No. 1 Group at Bawtry 'to assume command in the event of the destruction of HQ Bomber Command' there is no evidence to suggest that command authority to initiate nuclear retaliation was explicitly delegated to Group Commanders.[89] Indeed, if the C-in-C considered it necessary to delegate the authority contained in his Supplementary Directive, 'this should be brought explicitly to the attention of the Prime Minister and the Directive amended as necessary'.[90] It was nevertheless noted that the directive did not debar the C-in-C from delegating this authority. This may not have been necessary. In the event of HQ Bomber Command's destruction, the Commander of No. 1 Group would then become C-in-C Bomber Command and assume all his command directives including delegated authority to initiate nuclear retaliation. Thus a Soviet decapitation attack would have the effect of devolving nuclear command authority downward within the command structure.[91]

Conclusion

By the late 1950s, advances in Soviet missile technology threatened to undermine the credibility of the British deterrent. The deployment of M/IRBMs reduced reaction time to 15 minutes and made the V-force bases vulnerable to attack, whilst Soviet missile defences threatened the ability of the bomber force to reach their assigned targets. These developments had important implications for custody and political control. Indeed, prior to the late 1950s C^3 issues were almost exclusively *post hoc* arrangements. However, with warning time reduced to 15 minutes such arrangements could not continue. To ensure nuclear retaliation and eliminate accidental or unauthorised use, a formalised command and control procedure was urgently required. To achieve this aim, three measures were adopted. First, to provide continuity of political leadership, the Prime Minister appointed a designated deputy with the authority to launch Britain's nuclear forces. Second, to retain central command authority in the event of a decapitation attack, an alternative government HQ was constructed as an alternative centre for authorising nuclear retaliation. Third, to ensure retaliation, nuclear authority was delegated to the military as a last resort. In the event of a Soviet nuclear attack and the destruction of Britain's political leadership, Bomber Command was directed to launch a nuclear assault on the Soviet urban population by all means available.

For Britain, the delegation of nuclear use authority to the military ensured that in the event of a Soviet decapitation attack all civilian constraints on the use of nuclear weapons were removed. A Soviet attack aimed at the British NCA would 'be an attack on the safety catch of the entire command structure, and the Soviets would be destroying the one mechanism holding back all-out retaliation'.[92] That the resulting nuclear response might be uncoordinated was not important, as the operative goal of British C^3 was to ensure retaliation by whatever means possible. The delegation of nuclear use authority to the military has been described 'as an extremely powerful aspect of deterrence, and one that overcomes any technical or procedural weaknesses in the C^3 system'.[93] The potential dangers of operating such a system, however, is that the risk of nuclear inadvertence or unauthorised use is subordinated to the primary objective of ensuring retaliation. For Britain, with limited resources to spend on command and control (and in the absence of any viable alternative) such a risk was considered politically acceptable.

NOTES

1. François Heisbourg, 'The British and French Nuclear Forces', *Survival* 31/4 (July/Aug. 1989) p.305.
2. See for example, Congressional Budget Office, *Strategic Command, Control and Communications: Alternative Approaches for Modernisation* (Washington DC: USGPO 1981); Desmond Ball, *Can Nuclear War be Controlled?* Adelphi Paper No. 169 (London: IISS 1981); Paul Bracken, *The Command and Control of Nuclear Forces* (New Haven, CT Yale UP 1983); Bruce Blair, *Strategic Command and Control* (Washington DC: Brookings 1985); Ashton Carter, John Steinbruner and Charles Zracket (eds.) *Managing Nuclear Operations* (ibid. 1987); Kurt Gottfried and Bruce Blair (eds.) *Crisis Stability and Nuclear War* (Oxford OUP 1988); Scott Sagan, *Moving Targets: Nuclear Strategy and National Security* (Princeton UP 1989).
3. The literature on British command and control is limited: see Shaun Gregory, *The Command and Control of British Nuclear Weapons* (U. of Bradford Sch. of Peace Studies, Peace Research Report No. 13, Dec. 1986); *Nuclear Command and Control in NATO: Nuclear Weapons Operations and the Strategy of Flexible Response* (Basingstoke: Macmillan 1996) Ch.4; Lawrence Freedman, 'British Nuclear Targeting' in Desmond Ball and Jeffrey Richelson (eds.) *Strategic Nuclear Targeting* (Ithaca, NY: Cornell UP 1986); Marco Carnovale, *The Control of NATO Nuclear Forces in Europe* (Oxford: Westview Press 1993) Ch.5.
4. Peter Feaver, *Guarding the Guardians: Civilian Control of Nuclear Weapons in the United States* (Ithaca, NY: Cornell UP 1992); Bruce Blair, *The Logic of Accidental Nuclear War* (Washington DC: Brookings 1993); Scott Sagan, *The Limits of Safety: Organisations, Accidents and Nuclear Weapons* (Princeton UP 1993); L. Wainstein *et al.*, *The Evolution of US Strategic Command and Control and Warning, 1945–1972*, Study S-467 (Arlington, VA: Inst. for Defense Analysis, June 1975).
5. Albert Wohlstetter, 'The Delicate Balance of Terror', *Foreign Affairs* 37/2 (Jan. 1959) pp.211–34; Glen Snyder, *Deterrence and Defense: Towards a Theory of National Security* (Princeton UP 1961).
6. Blair, *Strategic Command and Control* (note 2) p.4.
7. Peter Feaver, 'The Politics of Inadvertence', *Security Studies* 3/3 (Spring 1994) p.501. Emphasis in the original. For discussion of these three debates, see Bradley Thayer, 'The Risk of Nuclear Inadvertence: A Review Essay', ibid. pp.428–93; see also, James Blight and David Welch, 'Risking "The Destruction of Nations": Lessons of the Cuban Missile Crisis for New and Aspiring Nuclear States', ibid. 4/4 (Summer 1995) pp.811–50 and Jordan Seng, 'Less is More: Command and Control Advantages of Minor Nuclear States', ibid. 6/4 (Summer 1997) pp.50–92.
8. Ian Clark and Nicholas Wheeler, *The British Origins of Nuclear Strategy 1945–1955* (Oxford: OUP 1989); Martin Navias, *Nuclear Weapons and British Strategic Planning, 1955–1958* (ibid. 1991); Jan Melissen, *The Struggle for Nuclear Partnership: Britain, the United States and the Making of an Ambiguous Alliance 1952–1959* (Groningen: Styx, 1993); Ian Clark, *Nuclear Diplomacy and the Special Relationship: Britain's Deterrent and America, 1957–1962* (Oxford: OUP 1994); Christoph Bluth, *Britain, Germany and Western Nuclear Strategy* (ibid. 1995); John Baylis, *Ambiguity and Deterrence: British Nuclear Strategy 1945–1964* (ibid. 1995).
9. The article is based on an 180,000-word report, *Fail Deadly? Britain and the Command and Control of Nuclear Forces 1945–64* (Aberystwyth 1997), funded by the Nuclear History Program and the Welsh Higher Education Funding Council. An abridged version of the report entitled *Planning Armageddon: Britain, the United States and the Command of*

Western Nuclear Forces 1945–64 is to be published by Harwood in 1999.
10. For details of other British systems, including naval forces, see ibid.; for discussion of arrangements for the Thor intermediate range ballistic missiles see ibid., and Stephen Twigge and Len Scott, 'The Other Other Missiles of October: the Thor IRBMs and the Cuban Missile Crisis', [forthcoming].
11. John Steinbruner, 'Nuclear Decapitation', *Foreign Policy* No.45 (Winter 1981–82) pp.16–28.
12. Ashton Carter, 'Assessing Command System Vulnerability' in Carter *et al. Managing Nuclear Operations* (note 2) pp.560–73.
13. Jonathan Tucker, 'Strategic Command-and-Control Vulnerabilities: Dangers and Remedies', *Orbis* 26/4 (Winter 1983) pp.941–63.
14. John Steinbruner, 'Launch Under Attack', *Scientific American* 250/1 (Jan. 1984) pp.23–33; Blair, *Logic* (note 4) Ch.6.
15. John Steinbruner, 'Choices and Tradeoffs' in Carter *et al. Managing Nuclear Operations* (note 2) p.540.
16. For a detailed examination of presidential powers, see Frank Klotz, 'The US President and the Control of Strategic Nuclear Weapons', (Unpub. DPhil, Oxford U. 1980).
17. Public Record Office, Kew (hereafter PRO): AIR 2/15001, Direction and Control of Strategic Bomber Forces, May 1958.
18. PRO: AVIA 65/1155, Air Staff Requirements, 16 March 1955.
19. The work conducted at Fort Halstead was later transferred to Aldermaston in April 1950. For more details, see Brian Cathcart, *Test of Greatness: Britain's Struggle for the Atom Bomb* (London: John Murray 1994) pp.127–44.
20. Herod was an acronym: High Explosive Research Operational Deployment.
21. Humphrey Wynn, *RAF Strategic Nuclear Deterrent Forces: Their Origins, Roles and Deployment 1946–1969* (London: HMSO 1994) p.91.
22. PRO: AIR 2/13777, memo on RAF assembly teams for atomic weapons, c.1951.
23. PRO: AIR 2/13777, Herod Committee, agenda for meeting, 24 Jan. 1951.
24. PRO: AIR 2/13783, RAF Assembly Teams for Atomic Weapons, Appendix A, c. Jan. 1951.
25. PRO: AIR 2/13777, Herod Committee, agenda for meeting, 24 Jan. 1951.
26. For further details, see Cathcart, *Test of Greatness* (note 19) pp.137–9.
27. For evolution of US arrangements see Feaver *Guarding the Guardians* (note 4).
28. PRO: AIR 2/13783, Responsibility for Storage of Atomic Weapons, July 1949.
29. Ibid. To satisfy US concerns it was agreed that wherever possible British security procedures for the storage of atomic weapons should be 'co-ordinated with that of the Americans'.
30. PRO: AIR 2/13777, Herod Committee, minute of meeting, 11 June 1951
31. PRO: AIR 2/13783, The Introduction of Atomic Bombs into the Royal Air Force, July 1951.
32. Ibid.
33. PRO: AIR 2/13783, draft minute from VCAS to Secretary of State, 15 July 1951. Composed of polonium and beryllium, the initiator was a small device no bigger than a ball bearing, which sat in the centre of the plutonium core. On detonation, it emitted a surge of neutrons which 'kick-started' the nuclear chain reaction.
34. PRO: AIR 2/13777, Herod Committee, minutes of meeting, 11 June 1951.
35. Ibid. 4 June 1951.
36. Wynn, *RAF Nuclear Deterrent Forces* (note 21) p.91.
37. PRO: AB 16/1128, Joint paper by the Division of Atomic Energy, Ministry of Supply, and Gp Capt Wilson, 27 Sept. 1950.
38. PRO: DEFE 32/3 D(53) 3rd Mtg, 25 Feb. 1953.
39. Wynn, *RAF Nuclear Deterrent Forces* (note 21) p.92.
40. PRO: AIR 2/15917, Cross to D. of Ops, 10 July 1953.
41. PRO: DEFE 4/74, COS (54) 396, 10 Dec. 1954.
42. PRO: AIR 2/15917, Dispersal and Operation of the Medium Bomber Force, c. Dec. 1954.
43. Ibid.
44. PRO: AIR 2/15917, ACAS(P) to VCAS, 16 May 1955.
45. PRO: AIR 20/10277, Medium Bomber Force, Readiness During a Period of Tension, 28 Sept. 1956

46. PRO: AIR 20/10277, Bomber Alert and Readiness Plan, 12 Dec. 1957.
47. PRO: DEFE 7/728, Defence Committee, Emergency Powers, memo by Chairman of the Defence (Transition) Committee, undated.
48. Ibid.
49. Launching of Nuclear Reprisal, Aide Mémoire, 14 May 1958, RG 59, Policy Planning Staff Records, 1957–61, Lot 67D548, Box 130, Great Britain, US National Archives. We are grateful to William Burr of the National Security Archive for drawing our attention to this document.
50. Ibid.
51. In Aug. 1962, to increase the reliability of communications, the Air Ministry gave authority for an airborne command post to ensure an alternate means of passing release messages to the medium bomber force without recourse to landline communications. In the wake of Skybolt's cancellation, however, the project was eventually abandoned.
52. For more details see, Bracken, *Command* (note 2) p.22. In contrast with the procedure adopted by SAC, the V-Force was never placed on continuous airborne alert. The increased logistic support and extra fatigue placed on the aircraft were considered an inappropriate use of Bomber Command's resources. For further details of SAC's operational procedures in the 1960s, see Sagan, *Limits* (note 4) pp.63–9.
53. PRO: DEFE 32/6, COS (61) 9th mtg, 7 Feb. 1961.
54. PRO: DEFE 25/49, GEN 743/10 (Revise), 23 Jan. 1962.
55. GEN 743 files remain closed, and can be found in PRO: CAB 130/177. In 1964, its functions were transferred to the Cabinet Committee on Nuclear Retaliation Procedures. These files are also closed and are located at PRO: DEFE 24/228-30.
56. See Twigge and Scott, *Planning Armageddon* (note 9) Ch.4.
57. In an exercise to test the procedures of the Murphy-Dean agreement, it was noted that 'In the favourable circumstances of these exercises, in particular that Ministers and the President have been forewarned and are readily available, it would have been possible for Ministers to have assembled at No. 10 with the Prime Minister and a decision taken.' PRO: AIR 20/10620, Thor Readiness, 3 March 1960.
58. Congressional Research Service, Committee on International Relations, *Authority to Order the Use of Nuclear Weapons* (Washington DC, Library of Congress, 1 Dec. 1975) p.10.
59. PRO: PREM 11/3815, Brook to Sir Frank Lee (PUS Treasury), 25 Aug. 1961. The Government's War Book contains the procedures for obtaining political authority to launch nuclear weapons and is held within government departments who 'need to know'. In the early 1960s, other Departments were unaware of the existence of this version and given an expurgated version, which was adequate for their purposes, PRO: CAB 21/4350, Brook to Prime Minister, 20 Aug. 1960.
60. PRO: CAB 134/2554, Transition to War Committee, Terms of Reference, 24 Nov. 1961. The committee absorbed all the functions of the Defence (Transition) Committee.
61. For a fully inclusive list of the Presidential succession and its implications, see Gregory, *Nuclear Command* (note 3) pp.82–5.
62. PRO: DEFE 25/49, Brief for Brook, 3 May 1961.
63. GEN 743/10 (Revise), see note 54.
64. The Cabinet order of precedence was decided by the Prime Minister 'according to his wishes'. In 1958 the order was: Prime Minister, Home Secretary, Lord Chancellor, Foreign Secretary, Chancellor of the Exchequer, Commonwealth Secretary, Secretary of State for Scotland, Lord President, Minister of Defence, President of the Board of Trade, PRO: CAB 21/4326, Brook to Prime Minister, 6 Jan. 1958. Within the documents so far available, there is no indication that the Prime Minister's designated deputy was required to sit in Cabinet or indeed be a member of the House of Commons.
65. Vernon Bogdanor, *The Monarchy and the Constitution* (Oxford: OUP, 1995) p.87.
66. *House of Commons Debates*, vol. 663, col. 633, 19 July 1962.
67. PRO: AIR 20/1113, A Study of Human Factors in Strategic Deterrent Systems for the United Kingdom, May 1958. Emphasis in original document.
68. Gregory, *Nuclear Command* (note 3) p.106.
69. For more details concerning the functions of PINDAR see, ibid. pp.104–5; *House of*

Commons Debates, vol. 242, written answers, cols. 396-98, 29 April 1994; Duncan Campbell and Patrick Forbes, 'New Whitehall Bunker', *New Statesman*, 26 July 1985, p.6.

70. For details see, Nick McCamley, *Secret Underground Cities* (London: Leo Cooper 1999). See also *Daily Telegraph*, 6 Jan. 1999. In its early stages of development the complex was given the codenames 'Burlington' and 'Stockwell'.
71. Wainstein, *Evolution* (note 4) p.315.
72. The UK Commanders-in-Chief Committee was responsible for co-ordination of home defence and providing assistance to the RAF for launching the nuclear counter-offensive. The Padmore Committee's official title was the Machinery of Government in War Sub-Committee and was responsible for advising Ministers on the maintenance of central government control in the event of thermonuclear attack.
73. PRO: AIR 8/2376, CIC (56) 26, UK Command Structure in War, 6 June 1956.
74. The Prime Minister's directive on 'Turnstile' planning is contained in DH (O) (MG) (61) 20. The document is classed as Civil and Home Defence and still retained under the provisions of the Public Records Acts. Extracts from the directive can be found in PRO: DEFE 4/152, Confidential Annex to COS 17th mtg, 28 Feb. 1963; DEFE 5/136, Annex to COS 96/63, 4 March 1963.
75. PRO: DEFE 4/152 (note 74).
76. COS 96/63. See note 74.
77. PRO: CAB 131/27, D (62) 10, 6 Feb. 1962. Wilton Park was located 18 miles from Fighter Command HQ and 28 miles from London. In war it was designated to serve both as the Joint Headquarters for the UK Commander-in-Chiefs Committee and GHQ UK Land Forces.
78. Gregory, *Nuclear Command* (note 3) p.106.
79. PRO: AIR 20/10620, D. of Ops. to VCAS, 3 March 1960.
80. PRO: AIR 8/2201, United Kingdom procedures prior to action by nuclear retaliatory forces based in the United Kingdom, Jan. 1959.
81. PRO: AIR 8/2238, VCAS to Cross, 11 Aug. 1959.
82. PRO: DEFE 25/49, Meeting With Brook, 3 May 1961.
83. PRO: DEFE 25/49, Playflair to Mountbatten, 26 June 1961.
84. GEN 743/10 (Revise), extract from JIC (61) 29 (Final).
85. DEFE 25/49, Brief for Mountbatten, undated.
86. Ibid.
87. PRO: AIR 2/16433, Extract from GEN 743/2, 23 Aug. 1961.
88. PRO: AIR 8/2530, Supplementary Directive to Air Marshal Sir Kenneth Cross, 25 Sept. 1962.
89. AIR 19/964, Command Organisation, Feb. 1960.
90. AIR 2/16433, Nuclear Release Procedures, 13 July 1965.
91. The delegation of nuclear command in Britain, largely mirrored the procedures adopted in the USA. Testifying to Congress in 1960, CINCSAC, Gen. Power acknowledged that 'arrangements existed for him to launch a retaliatory strike after verifying that an enemy nuclear strike was under way in circumstances in which the President was not available'. Blair, *Logic* (note 4) p.49.
92. Bracken, *Command and Control* (note 2) p.202.
93. Daniel Shuchman, 'Nuclear Strategy and the Problem of Command and Control', *Survival* 29/4 (July/Aug. 1987) p.340.